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ABSTRACT

Informal learning environments compel the design of activities that are both appealing and educational. This paper addresses issues involved in the design of science television programs for preadolescents, drawing more specifically on the case of a French-language series currently in production in Montreal. The program goals and format are discussed in relation to the target audience's developmental characteristics, their attitudes toward science, and their experience with the television medium. Such a series, it is proposed, should attempt to provide an emotional experience that is entertaining, involving and relevant as well as a cognitive experience that is challenging and empowering. Suggestions are offered as to how these qualities might be implemented in a television program. Experience with the series leads one to believe that the initial tension between learning and entertainment may be resolved creatively. (Author/CW)

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THE DESIGN OF A TELEVISION SERIES ON SCIENCE FOR PRE-ADOLESCENTS

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ABSTRACT

THE DESIGN OF A TELEVISION SERIES ON SCIENCE FOR PRE-ADOLESCENTS

Informal learning environments compel the design of activities that are both appealing and educational. This paper addresses issues involved in the design of science television programs for pre-adolescents, drawing more specifically on the case of a French-language series currently in production in Montreal. The program goals and format are discussed in relation to the target audience's developmental characteristics, their attitudes toward science and their experience with the television medium. Such a series, it is proposed, should attempt to provide an emotional experience that is entertaining, involving and relevant as well as a cognitive experience that is challenging and empowering. Suggestions are offered as to how these qualities might be implemented in a television program. Experience with the series leads one to believe that the initial tension between learning and entertainment may be resolved creatively.

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1. INTRODUCTION

The ability of formal science education programs to adequately prepare tomorrow's citizens to be informed about science and technology has been the subject of much debate, both in Canada and in the United States (NSTA, 1984; SCC, 1984). Despite the unequivocal importance of formal education, it is but one of several learning experiences in children's lives. Children also learn a great deal in informal contexts, that is from their families, from their friends, from extra-currricular activities and, from television (Bryant et al., 1983). Indeed, television has unique advantages as a potential source of information about the world. It can overcome time and space barriers to present knowledge, experiences, unique views of phenomena and inspiring role-models that would otherwise remain inaccessible to direct experience. Given the time children spend watching television, it would seem worthwhile to consider how to take advantage of the wide availability and strong appeal of television to complement the goals of science education.

However, there may be an inherent paradox in wanting to promote science through television that stems from the commercial nature of television itself. Science programs have to contend with serious competition from expensively-produced entertainment programs for viewership. And since television is essentially an entertainment medium, children develop expectations toward the medium which may run counter to the educational goals of a science program. For instance, Salomon (1979) has shown how preconceptions of television as an 'easy' medium may lead children

to invest less mental effort in processing television content than in processing print media. Also, television is a spontaneous, multi-faceted activity such that actual involvement in the program is a function of the viewer and of the specific viewing situation. In fact, some might even be led to doubt the learning value of a science program, were such a program to become popular. Indeed, Clark (1982) has drawn attention to a seemingly paradoxical antagonism between enjoyment and achievement, that is, the tendency for students to learn less from the instructional methods they report enjoying the most. Nonetheless, these reservations should not preclude any hope of successfully merging science with television.

We do know for a fact that children <u>can</u> learn a great deal from educational television, especially when it is designed with their needs and characteristics in mind (i.e., Bryant et al., 1983). The design of successful programs of this kind is usually guided by a program of formative research. "Formative research in television is a production and planning instrument that links producers and potential audience in the process of creating and refining a television product" (Caron & Van Every, 1989, p.17). For instance, the series "*3-2-1 Contact*", produced by the *Children's Television Workshop*, succeeds in merging science objectives with an entertainment format by tailoring the program in accordance with pre-adolescents' social and intellectual needs and with their television preferences. The impressive program of formative research surrounding the creation of "*3-2-1 Contact*" has contributed immensely to our understanding of how television might become an effective avenue to science for pre-adolescents (Mielke,

1983). In the end, it appears that with regard to television, enjoyment is positively related to learning. Children who reported enjoying 3-2-1 Contact also learned more from the program (RCL, 1987).

In a similar vein but on a more modest scale, the *Centre for Youth and Media Studies* at the *Université de Montréal* has also been conducting formative research on a French-language science television series for pre-adolescents, *Les Débrouillards* (i.e. "The resourceful ones") [1]. This concept was developed by *Agence Science-Presse*, which has been especially active in popularizing science for children in the province of Quebec since 1979. ASP publishes a monthly magazine ("Je-me-petit-débrouille") and newspaper chronicles and also oversees a network of science clubs. The agency's philosophy is 1) to awaken curiosity and foster a sense of amazement for the phenomena that surround us; 2) to satisfy children's quest for understanding the world around them; 3) to promote a vision of science as an enjoyable and accessible activity; 4) to have children engage in meaningful scientific experiences; and, 5) to highlight the scientific and technological achievements of Canadian society. These objectives remain the cornerstone of the television series.

Predictably, the dual nature of such a program, that is, its educational goals coupled with its entertaining dimension has been

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[1] The series is being produced by *Les Productions SDA* and is funded in part by the *CRB Foundation* in Montreal, Canada. The series is scheduled for weekly broadcast as of September 1990 on the French-language national network, *Radio-Canada*. For a fuller description of the series, the reader is referred to appendix 1.

at the heart of the creative process underlying the series and continues to pose a special design challenge. This paper provides the opportunity to share some of the design principles that are beginning to emerge from our experience with this project. Hopefully, it will add to our understanding of television as an informal learning situation, especially in regard to science for a young audience. The results of formative research on the scripts and the pilot program have been reported in detail elsewhere (CYMS, 1988; CYMS, 1989) and will only serve to illustrate specific points about the design process.

2. SCIENCE, TELEVISION AND THE TARGET AUDIENCE

Prior to discussing the design process behind *Les Débrouillards*, I will briefly review some psychological, educational and communication research which has been instrumental in shaping the goals and format of the series.

2.1 Pre-adolescents' development

Potentially, pre-adolescents are an ideal audience for a science television program, as other researchers have pointed out (Mielke, 1983). **On a cognitive level**, children of this age group have been described by Piaget as being in a concrete operational stage of thinking (Ginsburg & Opper, 1979). They have moved away from perceptually-bound reasoning and are able to think through the causes and consequences of phenomena on logical grounds much

better than before. They are reality oriented, interested in understanding and mastering the world around them and open to new experiences. However, they have not yet fully mastered the reasoning skills required for scientific experimentation. They need to be guided in the exploration of actual phenomena that may be directly acted upon. They also need concrete illustrations of abstract concepts. Further, children develop their own intuitive conceptions of phenomena. Science content should be tailored to these levels of understanding in order to help children make sense of the information provided (Linn, 1986).

On a social level, pre-adolescents are gradually emerging from the family circle and developing a solid network of their own. Thus far, the series intends to acknowledge the social development of this age group by structuring the program around the concept of a club, which implies a commonality of interests among the members as well as a physical meeting place. Pre-adolescents are also on the point of making their first career-related choices as they embark on a high school course. Children of this age are at a critical point in shaping their attitudes toward science as a field of endeavor, whether it be as an academic, leisurely or professional pursuit. Therefore, it also seemed important for the series to address some current myths about science and scientists.

2.2 Children's misconceptions about science

One of the prevailing myths about science corresponds to a benevolent encyclopedic view. Science is perceived as a storehouse

of unquestionable truths which only need to be (painfully) memorized but which at least provide answers (sometimes all of them) to most practical problems which besiege us. This pragmatic orientation to science has been observed on different occasions (CYMS, 1989; Tremblay, 1985). Such a fact-oriented approach overlooks the dynamic process of scientific thinking as an eminently human enterprise, hence a process that can be mastered and that can (and should) withstand evaluation. Accordingly, it was proposed that the series should not only share scientific findings with the audience but also attempt to **convey a more complete picture of scientific thought**, namely to: 1) show the merits of science as a logical, reality-based approach to problem-solving as opposed to magical thought or a blind trial and error approach; 2) show the limitations of science in the face of social, economic or philosophical issues; 3) give a sense of science as an evolving discipline with changing theoretical viewpoints and remaining open questions; 4) show how intuition and imagination are also necessary to the pursuit of science.

Another myth considered to interfere with aspirations toward a scientific career pertains to the view of the scientist as an unsociable genius (usually male). In this respect, our own preliminary exploration of children's attitudes toward science (CYMS, 1989) are in accordance with the results of others (i.e., Mielke, 1983). Therefore, it was agreed that the series should make special efforts to **present a more realistic picture of scientists and scientific work**. In order to undercut the solitaire vision of scientific workers, it was resolved to highlight

the social dimension of their professional lives. This can be achieved by showing the actual team work that is behind most research as well as science people's involvement with broader contemporary social issues such as health, the environment, etc... It was also deemed important to provide glimpses into scientists' personal lives, showing them to have mates and families as anyone else. In order to qualify the stereotypical view of the scientific as inordinately bright, we thought of highlighting the range of personal qualities involved in scientific work (i.e., intuition, persistance, and leadership, in addition to intelligence) and pointing to the broad gamut of science-related occupations that call for different profiles of abilities.

A recurrent finding in different cultural milieux is the difference between boys and girls with respect to their attitudes toward science (CYMS, 1989; Mielke, 1983; Tremblay, 1985). Boys are generally more interested in science and also attracted by technological achievements whereas girls are traditionally drawn to the natural and social sciences when they do show an interest in science. Their reservations about science may be due to perceived self-inadequacies or to a distorted view of scientific work which makes it seem incompatible with feminine qualitites. In some cases, girls' reluctance towards science has been linked to a greater social consciousness of the undesirable consequences of technological advancements. Hence, an important goal that the series shares with 3-2-1 Contact is to **present female role-models successfully (and happily) engaged in scientific careers**. In addition, the producers will be seeking role models for members of ethnic

minority groups to reflect the increasingly diverse cultural mosaic of contemporary Quebec.

2.3 Children and television in Quebec

Young Canadians, as their American peers, watch a great deal of television. Surveys over the last few years indicate that they are viewing between 20 and 25 hours of television weekly (Caron et al., 1990). Television is so embedded in children's lives, they have come to develop **specific preferences and expectations toward the medium**. Pre-adolescents especially enjoy action programs and situation comedies Hence a survey among Quebec teenagers showing they intensely disliked science and news programs comes as no surprise (Tremblay, 1985). With respect to the format of television programs, formative research revealed the same preferences for a narrative context, sophisticated visuals and realistic humor as with larger samples of the same age group (Mielke, 1983) .

Although French-speaking viewers have access to and watch English-speaking channels to some extent, and even though foreign programming is also available in translated versions, the local French programming is generally more popular among viewers, both adult and children alike. Young viewers can therefore be very **receptive to programs that are novel and that reflect their cultural identity**, but they have also become accustomed to high production values through their general exposure to American programming. In spite of the extra financial burden such

expectations entail (given a relatively small market), the investment in an original production is rewarded by a better cultural match and a more intimate rapport with the audience. In short, a successful television adaptation is shaped by a multitude of factors, some general to children of that age group and to television in North America, others more germane to the specific cultural context of Quebec.

3. A FRAMEWORK FOR THE DESIGN OF A TELEVISION PROGRAM

Given the goal of fostering an interest in science in pre-adolescents via television, what are some of the qualitites that we should strive to implement in the program? Presently, we are focusing our efforts on a few key dimensions that I believe are critical for the success of such a program, dimensions that touch upon both the emotional and intellectual experience of the viewer. On an emotional level, I think the viewer needs to view the program as **entertaining, involving and relevant**; in addition, the program needs to be experienced as **challenging and empowering** on an cognitive level. In reality, all of these qualities are inter-connected and play out against each other to form the total texture of the program. As a consequence, there is no single means to achieve a particular quality and the end result will ultimately depend on the interaction between the individual viewer and the program itself. However, in the process of designing an entirely new program, there is a need for some guidelines that can guide the multiple decisions that need to be made along the way. The

Table 1

DESIGN FRAMEWORK FOR A TELEVISION PROGRAM ON SCIENCE FOR PRE-ADOLESCENTS

Ideal qualities of the program as experienced by the viewer	**Preferred means to achieve those qualities**
A. Emotional level	
1. Entertaining	a) Fascinating content
	b) Dramatic narrative
	c) Action, liveliness
	d) Humor, spontaneity
	e) Production (music,editing,...)
2. Relevant	a) Topics of natural interest
	b) Connections with everyday-life
	c) Problem-solving context
	d) Identification with characters
	e) Direct participation
B. Cognitive level	
1. Challenging	a) Appropriate difficulty level
	b) Mix of delivery and discovery
	c) Cognitive involvement
2. Empowering	a) Match children's conceptions
	b) Concrete visual techniques
	c) Appropriate language level

framework summarized in Table 1 is proposed as a working tool for shaping new programs on science and also for screening existing ones.

3.1 Emotional dimensions of the viewing experience

3.1.1 Entertainment

Following the premise that the viewer comes to television primarily to be entertained, the science program needs to be appealing if it is to attract new viewers and hold their interest. There are several ways of making a science program entertaining. A first way is to take advantage of **children's fascination with the mysterious** side of things (extra-terrestrials, superstitions, legends,...) as an opportunity to contrast scientific thought with other forms of thinking. Children of that age are also interested in oddities and world records. In the pilot episode, for instance, a sequence on bats points out their special status as the only mammals that fly and their unique mode of spatial orientation. A stronger dramatic component could be built around the subject of bats by linking them to Hallowe'en traditions and legends about vampires.

A generally effective way to grab children's interest is to **couch the subject matter within a dramatic situation** by having the characters come to grips with unexpected events and personal problems in the course of their scientific pursuits. Mielke (1983) points out that a story line helps to carry the viewer through

less exciting material over the length of a program. The universal appeal of narratives has also been put to advantage in science programming for adults (Silverstone, 1984) and it would seem especially important to capitalize on this feature for young viewers. For example, 3-2-1 Contact uses an adventure component ("The Bloodhound Gang") to introduce the viewers to inductive reasoning as the characters take on the role of detectives to solve mysterious events in the neighbourhood.

Comedies are a favorite genre of the target audience and it is natural to try to make use of humor to make a program as entertaining as possible. However, it is important to **use humor and fantasy purposefully** in a science program, in order not to undermine the credibility of the program or to confuse the viewer. For instance, one gag in the pilot program featured an opera singer appearing on a television show whose piercing vocal notes make the glass of the television screen fall apart. Several children, and rightly so, judged the exaggerated style of this segment to be discordant with the realistic tone of the program. A casual interview with a young musician who demonstrated amusing sound effects with a synthesizer turned out to be a more successful kind of humorous episode.

The pilot episode also resorts to **animation as an entertainment device**. Inserts featuring "Beppo the Frog", borrowed from the comic strip of the magazine that gave birth to the television series, serve as comical interludes between the main segments. Beppo reacts in a humorous tone to what is going on in the program and blunders his way through some of the experiments. Even

though pre-adolescents express strong preferences for adventure and comedies, they also partake in the general appreciation of animation as a genre. This feature of the program was in fact quite popular. In this case, the fantasy is probably more acceptable by viewers because the animation format clearly delineates it from the realistic content of the program and avoids potential confusion as to the plausibility of the situation.

A fundamental rule in children's television is **take advantage of the liveliness of television** and to avoid "talking heads". Indeed, children enjoy action and quickly become disinterested in content that relies too heavily on the audio track. As a general rule, then, visual presentations should support verbal descriptions and dynamic presentations should be favored over static ones. Finally, production features such as music, visual editing and special effects should be used imaginatively to make the program as appealing as possible, especially during lengthier segments such as interviews and demonstrations. In short, the program needs to be enjoyable to watch throughout in order to win and maintain the viewer's attention.

3.1.2 Relevance

In developing its science magazine for pre-adolescents, *Agence Science-Presse* has always favored science topics that can be linked to familiar phenomena in children's everyday lives. This philosophy also governs the television series. However, not all children will necessarily be interested in a topic simply because

they are reminded of it every day. We need to take that philosophy one step further and make deliberate efforts to **clearly illustrate the relevance of that topic to children's personal lives**. This precept is especially important in the case of television through which we hope to reach children that may not be naturally attracted to science. In that perspective, we have been thinking of ways that could spark an interest in science by touching a personal chord in the viewer.

A first rule, it would seem, is to **focus on topics that are of special interest for 8 to 12 year olds:** the biological sciences and environmental concerns, communication media, space and technology (although more so for boys). Whenever possible, specific topics should **relate directly to the viewer's everyday life.** For instance, two recent events in Quebec, a widespread blackout caused by a magnetic storm and an earthquake, provide a shared cultural experience from which to build episodes on electricity and geology. When one's daily routine has been upset and one's vulnerability suddenly exposed, it becomes relevant to understand the workings of nature. All subject matter, therefore, should be tailored to **children's concerns and questions**, whether these be of a capital or trivial nature. For example, the segment on bats picks up a frequently expressed concern about the probability of bats attacking people.

Nonetheless, there is some doubt as to whether a magazine format that would form a collage of questions and answers would be entirely successful in holding the attention of the majority of child viewers throughout. One solution may be to **weave in those**

questions into a narrative structure whereby the characters need to figure out some solutions to get on with their daily lives. An assignment needs to be done, an object is broken and needs to be repaired, etc.... A narrative structure would only be successful, however, to the extent that the viewers can **emotionally relate to the characters on the screen**. Children of this age are quite critical of their peers on the small screen and do not easily forgive slip-ups. Characters need to be both believable and competent in order for the viewer to form definite allegiances. To the extent that children identify with the characters and are genuinely interested, we would expect them to **imitate the experiments being performed on television**. If viewers were also encouraged to perform some of the simpler activities while viewing, part of the information provided would take on a different meaning. For example, vibrating an elastic band between one's teeth with ears covered and uncovered allows the child to compare different sound vibrations as a function of the path of the sound waves.

3.2 Cognitive dimensions of the viewing experience

Pre-adolescents have mastered the basic symbolic tools of their culture and are eager to expand their knowledge base and to develop their specific talents as they attempt to establish themselves as autonomous individuals. Even though television is sought primarily for entertainment, I think it would be a mistake to underestimate the self esteem and gratifications that derive from understanding science content. Given that a program succeeds on the

emotional level as was discussed above, it should also **provide a challenging and empowering experience** on a cognitive level.

3.2.1 Challenge

For a program to be intellectually challenging, it first needs to hit upon the **right difficulty level**. Children are quick to resent content that is too easy and will simply ignore content that is above their ability. Finding the appropriate level requires the combined expertise of teachers and cognitive psychologists and a constant adjustment of the scripts to children's reactions. Another important dilemma for such a series is how to achieve the **right balance betwen delivery and discovery**, that is between providing information and bringing children to find out the answers for themselves, an issue that is also prevalent in science education (Linn, 1986). We took the position that excess in either direction would be detrimental to the goals of the series. On the one hand, we do not want to withold interesting information needlessly from the viewer nor slow down the program too much by following a painstaking discovery process. On the other hand, if too much "free" information is provided, the viewer might settle into a passive mental state or become overloaded with information and eventually tune out.

We decided to aim for an ideal equilibrium between the two modes and surmised that some segments would be more appropriate to one mode than the other. For instance, interviews with science people might naturally involve a high degree of information delivery

while demonstrations carried out by the actors themselves could more easily lend themselves to a slower discovery mode, at times involving mistakes along the way. We have also been searching for ways to **encourage more active mental involvement on the part of the viewer.** For example, we need to remind ourselves to insert questions and puzzles that are unraveled at the end of the program and to allow for pauses in the flow of information. We are presently exploring the possibility that the animated cartoon character could embody children's questions and hypotheses about the phenomena being observed without sacrificing his comical side. We also speculated on the possibility of salvaging the opera singer gag by asking the viewer whether such an accident could really occurr and ending the program without closure. Raising questions in addition to providing answers is essential not only to create a sufficient amount of challenge for the viewer, but also to convey a more realistic view of science as a dynamic process of searching for knowledge.

3.2.2 Empowerment

Empowerment in the context of a science program for children involves taking every available means to make the content comprehensible for the viewer. A first important issue to address is how to make the program **match children's intuitive conceptions about phenomena.** If a program designer is unaware of how children already conceive of a particular phenomenon, he or she runs the risk that the explanations will simply bypass the

viewer's understanding. Let's consider one example among others. Children tend to think that a heavier steel cube will displace more water than an equal size aluminum cube (Linn, 1986). If the goal were to demonstrate the displacement of liquids as a function of volume, one would then design the demonstration so as to acknowledge the particular bias that viewers already h l about the phenomenon. However, following the above discussion of the entertainment dimension, there should also be a motivating context for such a sequence, such as the need to salvage an object from underwater.

In the interest of fostering a better understanding of phenomena, every effort should also be made to **illustrate abstract concepts in a concrete manner** with the aid of props or visual effects. For example, having ping-pong balls bounce off a blaring loudspeaker in the pilot episode made a clear point about the vibration of sound waves. A special advantage of television is precisely the availability of a range of formal features which can serve such illustrative purposes in unique ways. Animation for instance, is a precious tool to help visualize invisible phenomena. Clever use of other special techniques such as graphic overlays, acceleration and deceleration, micro-photography, etc... is paramount for a clear and compelling exposition of complex processes.

A last issue related to the comprehensibility of science content is the use of an **appropriate language level**, one that is scientifically correct while avoiding needless technical jargon. However, one of the legitimate goals of a scientific education is to

introduce children to specialized language and to demonstrate the need for such terminology. The characters should then explain difficult terms or find out what they mean even as they possibly struggle to pronounce it. To the extent that the viewer can experience genuine understanding, within the limits of a television program. I think he or she could feel empowered to view things differently and seize in a very concrete manner that science content is within his or her intellectual grasp.

4. CONCLUDING COMMENTS

4.1 Expected outcomes of the series

Science objectives and the reality of children's television may not appear as compatible partners at first but I believe this inherent paradox actually paves the way for some creative solutions. The project which has served as a case in point to formulate some principles of design is still in progress. Some of the appealling features of the program to date have been those segments which depicted the protagonists in a casual, relaxed ambiance, that were humorous and plausible and made clear informative points. However, formative research on the appeal of the pilot episode aiso pointed to several areas in need of improvement if the series is to win a faithful audience and to achieve its goals. The major points to be addressed as the series nears its shooting schedule include the following: 1) how to create a more life-like context where the scientific content is perceived as blending into the natural course of

events; 2) how to achieve a closer match between the science content and children's intuitive conceptions; 3) how to achieve a better balance between explicit presentation of information and the inducement of cognitive processing on the part of the viewer; 4) how to make better use of production features to enhance the comprehensibility of the science content and to maintain a dynamic tempo throughout the program.

If the series in its final format takes full advantage of the television medium in the manner that has been discussed in this paper, I think it is reasonable to expect a positive influence to some degree. Viewing the series could lead to enhanced interest in science and increased participation in related activities, a more positive attitude toward scientists and scientific work, and better general knowledge about science, nature and technology. Naturally, television's special contribution to science education needs to be viewed in a long term perspective and in interaction with other sources of formal and informal learning (parents, other media, science clubs, etc...). Television has its limitations as a stand-alone learning situation but it can serve as a powerful lead-in to other experiences. More than half the viewers of 3-2-1 Contact did something as a result of viewing (i.e., conducting an experiment, visiting a museum, reading a book,...) (RCL, 1987).

The television series can initially benefit from the popularity of the *Débrouillards* concept as an extra-curricular activity without official links with the school system. Although the magazine is widely distributed in the schools and often used by teachers, it does not appear to be perceived by children as part of the curriculum.

Even though we can expect a reciprocal interaction between school learning and learning from television, the series needs to remain independent from the school curriculum in order to **favor the spontaneous involvement characteristic of informal learning environments**. During the summative evaluation phase of the project, we also plan to address the issue of whether and how the television series and its twin magazine complement each other in leading children to engage in science activities. The connections between the two media can be **mutually beneficial**, not only in terms of promotion but more importantly **as a way to extend learning opportunities** that neither medium could likely achieve on its own. For instance, the possibility of referring the viewer to detailed instructions in the magazine allows us to present more challenging hands-on experiments that are informative and enjoyable to watch on television.

4.2 The paradox resolved

Television offers the possibility of reaching out to a far greater number of children than can a science magazine for instance, but at the same time, it cannot assume an interest for the science content on the part of the viewers. Therefore, **great care needs to be given to the general appeal of a television program** if the aim is to win an audience to science. "Enjoyment becomes a particularly important variable in learning when the learning context is informal and many leisure activities compete for an audience's time" (RCL, 1987, p. 28). In the process of reaching

decisions about the design of a television program on science, I think one is led to a better understanding of the medium with regard to the child audience.

In the end, this improved understanding seems to bring about a **partial resolution of the paradox beween learning and entertainment** in that most design decisions appear to intertwine in their objectives and actually serve this dual purpose. For instance, to link science content to familiar phenomena serves the purpose of gaining attention since children enjoy their life experience to be reflected on the screen. At the same time, it makes an important point about the relevance of science to our daily lives, which is one of the goals of the series.

Because of the voluntary involvement of learners in informal situations such as television viewing, **program designers are compelled to search for ways to make science content relevant and comprehensible.** The principles that emerge from this practice could also apply to formal learning situations. Indeed, any teacher would be thrilled to generate the same kind of amazement that one eleven-year-old boy expressed in response to pilot program: "It's fun because you learn about things that are there, right under your nose, and you didn't even know about it!". Ultimately, we may want both formal and informal situations to merge with each other if learning of any sort is to become enjoyable and successful.

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APPENDIX 1

LES DEBROUILLARDS

Synopsis

The series

"*Les Débrouillards* " is a television series in the making for pre-adolescents designed to promote a better understanding of scientific phenomena and of the work that scientists do and above all, to generate interest and enthusiasm for the scientific realm. The program is meant to be entertaining as well as informative and gives a special importance to humor. By following the interactions of a group of friends their own age who are members of a scientific club, young viewers are encouraged to discover the world around them and to engage in active experimentation. The concept of a club reflects both the actual science clubs and the spirit of the magazine. The main characters are two boys and a girl between 9 and 13 years of age and a young female adult who acts as a resource-person. She is cast as a university science student (possibly a teacher trainee) which explains her willingness to partake in their science activities. She is friendly and enthusiastic, responsible without being authoritarian, supportive without being overprotective. Each of the children would have his or her own distinct physical type and personality to provide identification models for a wide range of youngsters in Quebec.

The program follows a modular structure comprised of three main types of segments: 1) *hands-on experiments* demonstrating scientific principles; 2) *field trips* (interviews with specialists conducted by the children themselves as well as visits to labs and natural locations); 3) *do-it-yourself crafts* that can be repeated by the viewer at home. Briefer interconnecting segments include animation with the frog mascot from the magazine, archival footage and information capsules. Each episode revolves around a specific theme (i.e., the sun, flight, nutrition, etc...) which is then used to introduce concepts and applications from different fields of science and technology.

The pilot program

The pilot episode features two boys, Sébastien and Hugolin, and two girls, Julie and Marie-Soleil who discover the nature of sound and its various implications in the world around them. They explain in concrete ways how sound is comprised of vibrations that travel through a medium, either gaz, liquid or solid by showing what happens when a gong is restrained from vibrating and what happens to ping-pong balls that are placed on an operating loudspeaker. An imaginary interlude on the moon provides an opportunity for talking about atmospheric conditions in an environment where air is absent. A visit to a hospital allows a doctor to demonstrate how ultra-sound technology is used to monitor the development of babies in the mother's womb. Later on, a biologist explains how bats orient themselves by projecting sound waves and attempts to demystify

children's fears about bats. An interview with a musician also provides the opportunity to demonstrate the applications of computer technology to modern music in an amusing fashion. Interspersed among these documentray parts are demonstrations of how to make a guitar and a stethoscope with simple materials. The children's conversations, whether it be about dog whistles or the recording of their own voice, always centers on the program's theme. The program ends on a humorous note with an opera singer demonstrating the power of her vocal cords.

Appendix 16

END

U.S. Dept. of Education

Office of Educa'ion
Research and
Improvement (OERI).

ERIC

Date Filmed

March 29, 1991